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ABSTRACT

Eighty-nine college students with varying levels of divergent thinking aptitude participated in a study focusing on the processing of concrete and abstract stimuli. The subjects were administered three divergent thinking instruments. Their processing of concrete and abstract stimuli was studied in two separate free-response tasks. It was hypothesized that free-response tasks would reveal shifts in abstraction level toward more concreteness of overt free associations to an abstract stimulus, along with self-reports of greater imagery mediation, on the part of subjects with higher divergent thinking aptitude. The results supported the hypothesis, suggesting greater flexibility between imaginal and verbal coding systems in high divergent thinking persons than in less divergent thinking persons. (Author/FL)

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FLEXIBLE USE OF THE IMAGINAL CODING SYSTEM AND CREATIVE APTITUDE

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ABSTRACT

This study focussed on the processing of concrete and abstract stimuli in undergraduates with varying levels of divergent thinking aptitude. It was hypothesized that free response tasks would reveal abstraction level shifting toward more concreteness of overt free associations to an abstract stimulus, along with self reports of greater imagery mediation, on the part of subjects with higher divergent thinking aptitude. Verbal learning research has tended to associate imagery mediation with concrete information and verbal mediation with abstract information. The creativity literature, however, has reported the use of imagery through metaphor and analogy in many abstract contexts of creative problem solving and artistic expression. Results supported the hypotheses, suggesting greater flexibility between imaginal and verbal coding systems in high divergent thinking persons than in less divergent thinking persons. A psycho-neurological basis for processing distinctions in creative persons is considered tentatively.

FLEXIBLE USE OF THE IMAGINAL CODING SYSTEM AND CREATIVE APTITUDE

By Helen F. Durio, Ph.D.
The University of Texas at Austin

The study of mental imagery, suffering from a hiatus lasting nearly fifty years, is the object of renewed interest among researchers largely due to increasing attention among American psychologists to cognitive processes and verbal learning. Investigations have centered upon imagery in relation to human coding processes utilizing information processing models, individual differences in use of imagery, and the value of imagery as a mnemonic (Bower, 1970; DiVesta & Sunshine, 1974; Paivio, 1971a). The study of creativity as separate from intellectual functioning is a somewhat younger research interest, peaking in the late 1950's with the factor analytic work of Guilford in divergent thinking. However, neither imagery nor creativity has been defined sharply in terms of specific behaviors.

There are writings linking the use of imagery with creativity, but few can be considered to be of an empirical nature (Durio, 1975). Many introspective studies of the thought processes of creative scientists suggest that the ability to

image does play a valuable role in problem solving (Roe, 1952; Krueger, 1976), while creative writers and artists appear to utilize imagery through metaphor and analogy for artistic expression. It is true that in 1883 Galton found successful scientists more deficient in imagery ability than housewives and children; however, Galton explained his finding by postulating greater reliance upon abstract symbols for thinking in the cognitive processes of more educated persons.

Paivio (1969; Paivio & Csapo, 1973) in researching imagery in relation to language and learning has developed the thesis that cognition is linked to two basic coding systems. One mode is verbal and the other mode is nonverbal or imaginal; thus cognitive mediation is served by this dual system of processing. The individual is more likely to use imagery coding with concrete imageable words, but tends to use a code emphasizing verbal mediators when associating abstract words.

It does seem reasonable to propose that the abstraction level of the stimulus being perceived is of major importance in attending, coding for storage, and retrieval in information processing. Research into verbal and imaginal coding systems in recall situations has established consistent findings with the two factors of stimulus abstraction level and mediation instructions. Paivio (1971a, 1971b) has found that under imagery instructions, a concrete stimulus evokes a

visual image more rapidly than does an abstract stimulus. Also, concrete stimuli are better recalled than less imageable abstract stimuli. Thus, relationships have been assumed between concrete stimuli and visuo-spatial nonverbal imagery encoding, and between abstract stimuli and verbal encoding.

However, more recently there has been awareness of the need to account for the integrative patterns seen with concrete and abstract sentences as stimuli, prompting Marschark and Paivio (1977) to write that "some common representational mechanism needs to be postulated...while at the same time that different (modality specific) mechanisms must be retained to explain the differences".

The cued recall paradigm, which has been used under conditions of different mediation instructions and controlled abstraction level of both stimulus and response items, is well suited to separating the learning effects of imaginal and verbal coding systems. However, it is perhaps not the best way to tap spontaneous mediation and individual semantic networks. Paivio's work with Ernest (Ernest & Paivio, 1971), as well as the work of Danaher and Thoresen (1972), and DiVesta and Sunshine (1974), suggest that individual coding propensities may also be important in efficient processing of stimuli. The value of storing vivid and concrete cognitions to facilitate retention has long been recognized, but the relationship between creative aptitude and dual processing tendencies has not been explored.

While it seems evident that semantic concreteness and imageability are interrelated, it does not follow that imagery is used only to represent internally those things with objective referents. If memory is considered the individualistic reconstruction process that Bartlett in 1932 suggested it to be, there is potential for encoding variation.

It seems likely that some individuals do use figural-spatial stimuli and imagery mediation flexibly to represent abstract information, as well as concrete information. The observed use of concretely imageable metaphors and analogies to represent abstract information in problem solving and artistic expression by creative persons suggests such a hypothesis. Creative persons may utilize imagery encodings in more complex abstract contexts to contribute to semantic integration, problem solving, and vivid expression.

Flexibility in the imaginal and verbal processing systems is implied by Krueger (1976) when he states that a concrete stimulus, assumed to evoke figural internal representations in dual processing theory, could be the spontaneous impetus at times for a chain of covert mediators which become increasingly modified from the external stimulus to benefit creative problem solving. He claims that the sudden insight into solving abstract problems by the creative scientists in his study was often based on inspiration from a common stimulus object, or its concrete mental represen-

tation. Similarly, the purposeful attempt to simplify abstract information at times through concrete imagery mediators has been noted in problem solving activities (Roe, 1952; Eiduson, 1962). Paivio (1971a) does not deny that abstract stimuli may generate imagery, but does feel imagery is less readily employed for abstract stimuli than in the processing of concrete stimuli. The inference is that concrete stimuli, assumed to be mediated by the imaginal system, are more likely to arouse concrete associations and/or concrete overt responses, than for concrete stimuli to arouse abstract associations and/or abstract overt responses.

The central question addressed in this investigation was whether imagery invoking concrete stimuli and verbal mediated abstract stimuli stimulate differences in free response patterns in persons with varying levels of creative aptitude. Specifically, do persons with higher levels of creative aptitude report using imagery more often when associating to an abstract stimulus than persons with less creative aptitude, and is their overt response to an abstract stimulus more concrete?

The research focussed on the processing of concrete and abstract stimuli in undergraduate students with varying levels of creative aptitude as indicated by Guilford's and Torrance's divergent thinking tests. While the construct of creative aptitude is sufficiently complex to preclude

definition by these measures alone, Guilford and Torrance instruments are considered acceptable operationalizations of creative aptitude for research purposes.

Procedures

Eighty-nine undergraduates at the University of Texas at Austin were administered two of Guilford's divergent thinking instruments (Making Objects, a figural content measure; and Simile Interpretations, a semantic content measure), and Torrance's Unusual Uses test, for classification purposes. The processing of concrete and abstract stimuli (a repeated measure) was studied in two separate free response tasks: 1) free associating to ten concrete and ten abstract figures, and 2) suggesting mnemonic links for ten concrete noun pairs and ten abstract noun pairs. Subjects were first given definitions and examples of verbal and nonverbal mediators before being presented with the stimulus items in each free association task. A stimulus was presented for 30 seconds and the subjects were asked to give in writing their primary free association, in addition to indicating whether their initial mediation was verbal or nonverbal. The concrete and abstract figures were subjected to pilot testing which established significant within subject differences in terms of concreteness ($p<.001$). The concrete figures consisted of recognizable

drawings of objects, while abstract figures consisted of non-recognizable lines or drawings (i.e. crossed lines) which could symbolize more than one idea. Nouns were selected from the list of 925 nouns rated for Concreteness, Imagery, and Meaningfulness by Paivio, Yuille, and Madigan (1968). Twenty concrete nouns (average Concreteness value of 6.93) and 20 abstract nouns (average Concreteness value of 1.61) were chosen. The two types of stimuli were equated for average Meaningfulness (5.91 and 5.93) according to Paivio et al norms, and paired randomly within each set.

Instructions were given students and practice examples worked. Test orders were varied and subjects were assigned randomly to different test orders.

Responses to both concrete and abstract stimulus terms on the two cognitive tasks were scored on the basis of two criteria. One was Response Concreteness, in which the 40 free responses for each subject were rated for concreteness by three independent judges on a seven point scale in terms of Paivio's definition of concreteness as proximity to an objective referent (Paivio, Yuille, and Madigan, 1968). The second criterion was Imagery Mediation Reports, in which self reports on the number of imagery mediators experienced across stimulus types were tallied for each subject. In addition to these measures, a cognitive questionnaire with self ratings and questions pertaining to thinking styles and preferences, along with a block rotation measure, Cubes, developed by Thurstone (1944) as

indication of spatial aptitude were administered. Spatial aptitude is considered to be a more objective measure of imagery ability than introspective self reports by several investigators (Ernest & Paivio, 1971; DiVesta, Ingersoll, & Sunshine, 1971). Whenever possible, questions in the cognitive questionnaire were in a forced choice or continuum format to avoid the response bias of social desirability.

A total of 20 variables were thus intercorrelated, and available as predictors in regression analyses.

All instruments and tasks were administered in 90 minute sessions to small groups of approximately 20 students. Subjects were drawn from the College of Education at the University of Texas at Austin. There were 89 complete profiles included in the final analysis.

Design

The study employed a 2x2x2x2 fixed effects design with repeated measures for the three criteria of Response Concreteness, Imagery Mediation, and Verbal Mediation Reports. Between subject factors were 1) two orders of test presentation, and 2) high and low levels of divergent thinking aptitude (defined by combining standard scores on the Guilford and Torrance measures and dividing the distribution by median split). Within subject factors were 1) two types of stimuli (figures and nouns) and 2) two levels of stimulus abstraction (concrete and abstract).

Data Analysis

Analysis of variance procedures for the 2x2x2x2 were carried out by an adaptation of the BIOMED program BMD08VA, developed at the University of Texas and called ANOVA8. Standardization of test scores, intercorrelation, multiple regression procedures, and intraclass correlation coefficients (as indication of interrater reliability on rating concreteness of free responses to stimuli) were carried out by V STAT computer programs (Veldman, 1974). Reliability coefficients for concreteness ratings ranged from the high .70's to the low .90's over the 40 stimuli. Multiple regression procedures allowed consideration of the best weighted combination of all independent predictor variables for the criterion of Divergent Thinking, and the criterion of Imagery Mediation Reports.

Results and Discussion

Response Concreteness Table 1 indicates that high divergent thinking persons responded more concretely to all stimuli than did low divergent thinking persons, $F(1/85) = 4.07$, $p = .04$. It was hypothesized that an interaction would occur between the abstraction level of the stimulus and divergent thinking level, but this did not occur. Results confirm the expectation that greater concreteness of response was elicited by concrete stimuli than by abstract stimuli, $F(1/85) = 310.84$, $p<.0001$. There was a significant inter-

action between test order and abstraction level of the stimulus. Test order 1 as a group displayed less difference between concrete and abstract figures in Response Concreteness than test order 2. One possible explanation is that administration of the divergent thinking tests prior to cognitive tasks, which occurred in test order 1, may have influenced abstraction level shifting. Perhaps these measures contributed to a subsequent divergent thinking response set which caused subjects to make more abstraction level shifts in test order 1 when free responding to concrete and abstract stimuli. However, there was not a corresponding interaction in reports of imagery mediation, to support this explanation. Thus it is just as likely that the test order by stimulus abstraction level interaction on Response Concreteness was due to chance.

Table 1

Imagery Mediation Reports Table 2 indicates that the prediction that concrete stimuli would have less advantage over abstract stimuli in eliciting imagery mediation reports in high divergent thinking persons was supported, $F(1/85) = 4.95$, $p = .02$. A main effect tendency for high divergent thinking persons to report more imagery to all stimuli than low divergent thinking persons also approached significance ($p = .11$). Only those cell means reaching significance are reported in the tables, but interestingly, inspection of cell means revealed that

high divergent thinking persons reported more imagery than low divergent thinking persons consistently to the more abstract comparison, whether it be nouns as opposed to figures, or abstract vs. concrete stimuli.

Table 2

Multiple Regression Analyses Multiple regression techniques were also utilized for the criterion of Divergent Thinking and the criterion of Imagery Mediation Reports. All independent variables and/or cognitive questionnaire items for these two criteria were utilized as predictors in initial models, both of which differed significantly from zero ($p<.001$). Each model was then reduced by computer program iterative sequence to the least number of predictors which indicated no significant improvement in prediction by the full model.

The Divergent Thinking Aptitude criterion could be as efficiently predicted by two predictors as all variables in the study. The creativity self rating and Response Concreteness to abstract figures proved to be the most important in explaining the variance in Divergent Thinking (Table 3). The creativity self rating was contained in the cognitive questionnaire. Subjects rated themselves on two attributes (unusualness of thought and relevant usefulness of thought) on seven point scales, which were summed to get the total rating for creativity. The accepted definition of creativity involves both originality and relevancy (Gilchrist,

1972), but in addition, this type of summative rating avoided some of the social desirability response bias which would have possibly resulted from using the terms "creative" or "creativity" in a self rating. (Interestingly, the self ratings on originality and relevancy were not correlated, $r = .01$, but each were significantly correlated with divergent thinking measures. This suggests some support for these measures in terms of construct validity.) Unidirectional abstraction level shifting is thought to account for the value of Response Concreteness to abstract figures as a predictor of Divergent Thinking.

Table 3

The Imagery Mediation criterion could be as efficiently predicted by the two predictors in Table 4 as all variables in the full model. The two predictors of importance in the reduced subset were Response Concreteness to abstract noun pairs and the self rating on dominant coding style from the cognitive questionnaire. It was expected that Response Concreteness would be an important predictor of imagery mediation by virtue of the inherent imagery-concreteness relationship, but it is interesting that it is concreteness to abstract noun pairs that explains the greatest variance in Imagery Mediation. Abstract noun pairs were the most abstract set of stimulus items in this study, so responding concretely to them reflected unidirectional abstraction level shifting in individuals. It is this type of shift that appears to be related to divergent thinking through imaginal coding

flexibility. As for the other predictor, it was the imagery end of the self rating on dominant coding style that is related to imagery mediation. The self rating was placed on a seven point continuum between verbal and imagery preferences in thinking so as to avoid the desirability of self report measures of imagery intensity. DiVesta, Ingersoll, and Sunshine (1971) concluded that introspective reports of imagery usage were confounded with social desirability, and thus lack construct validity. In this study there is no reason to

Table 4

believe that subjects felt imagery mediation to be a more desirable response choice than verbal mediation. Additionally, procedures required that when subjects reported their type of mediation they had to respond concurrently with an overt free association, indicative of their processing of stimulus items. Yet unexpected inverse or null relationships were found between spatial aptitude and imagery mediation as operationalized in this study. DiVesta el al concluded that objective measures of spatial aptitude were superior to self reports as indicators of imagery ability. The block rotation test and imagery mediation were associated negatively ($\underline{r} = -.157$) and the block rotation test and the imagery end of the dominant coding style preference related even less significantly ($\underline{r} = -.061$). While these coefficients are not high and the results of this study not definitive as to the constructs of spatial aptitude and men-

tal imagery, these results do not support the assumption that just any objective spatial aptitude measure is a better indicator of imagery usage or imagery ability than are forced choice or continuum self report measures. Such formats may be superior to the self ratings or self reports on imagery intensity, which do appear to have some response bias in terms of social desirability. Future study might also suggest that objective spatial aptitude measures relate more to convergent use of the imaginal coding system, while self report measures relate more to divergent use of the imaginal coding system.

Conclusions and Implications for Future Research

A synthesis of the findings from the preceding discussion of results offers some empirical support for the idea that imagery is more likely to be used by divergent thinking persons than by other persons in abstract contexts.

There was a strong trend for high divergent thinking persons as opposed to low divergent thinking persons to manifest more abstraction level shifting to abstract stimuli as represented by group differences in Response Concreteness and by Imagery Mediation Reports to stimuli. The concept of abstraction level shifting as an indicator of coding system flexibility to predict original and/or creative behavior requires operational refinement and further replication to reveal its usefulness. It appears that it is unidirectional shifting that may be of value, in that high Re-

sponse Concreteness to abstract stimuli, as well as more Imagery Mediation Reports to abstract stimuli, rather than low Response Concreteness and Imagery Reports to concrete stimuli, were associated with divergent thinking.

Whether divergent thinking can be conceived as a possible "integrative mechanism" between the imaginal and verbal coding systems, which Marschark and Paivio (1977) indicate is needed to fill a theoretical void, remains to be seen.

Since the central thesis of the study was confirmed, in that high divergent thinking persons did manifest greater processing flexibility to abstract stimuli than low divergent thinking persons, then one may make some inferences as to the nature of this cognitive difference in divergent thinking persons.

Perhaps this cognitive difference is based on neurological differences; perhaps creative persons have greater integration or interrelation between asymmetrical spatial and verbal processing functions of the right and left brain hemispheres. It is also possible that creative persons function maximally in both hemispheres. Kinsbourne (1978) has suggested that bisymmetry is adaptive and occurs under purposeful conditions. Kinsbourne hypothesizes an attentional model in which asymmetry results from the activation of a selector mechanism at the thalamic level. This provides a verbal mental set for a central processor at the cortical level. If Kinsbourne is right, perhaps creative persons have developed strategies to inhibit the central processor verbal stage of the complete cognitive processing sequence. This might be desirable in en-

hancing holistic processing of original sensory gestalten, which when integrated with verbal processing modes, aids creative productivity. It has been suggested by Bogen (1969) that the corpus callosum's mediating function between the hemispheres may benefit creativity. The extensive research being conducted on brain lateralization promises to benefit the disciplines of neurology, psychology, and linguistics.

Perhaps creative persons have developed cognitive strategies which promote flexibility, while avoiding excessive fixidness of mental set. Some writers (Walkup, 1967; Krueger, 1976) feel effort can be made empirically toward isolating the critical features of such cognitive strategies, in order to teach persons to modify their own thinking processes deliberately. Both Walkup and Krueger feel that training in using visual imagery is essential to the acquisition of creative problem solving strategies.

Perhaps divergent thinking is merely a manifestation of flexibility in intelligence, despite operationalized independence of the two constructs in some studies (Getzels & Jackson, 1962; Guilford, 1967). Undoubtedly, the domain of intelligence is multifactored; thus it is very likely that certain measures of divergent thinking are more related to particular intelligence test items than others. Ratings of originality, however, appear quite independent of structured intelligence

tests (Bourne, Ekstrand, and Dominowski, 1971). The nature of the task in terms of the degree of constraint imposed on the respondent undoubtedly affects the flexibility of response. Scores on free response measures of divergent thinking do not cluster with more structured instruments (Durio, In Print).

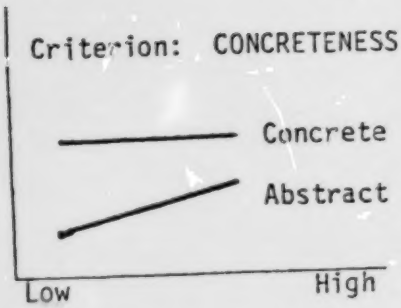
Perhaps the important distinction between intelligence and divergent thinking aptitude as they are operationalized centers upon eliciting imaginal holistic processing as a contributor to originality on divergent thinking tests. In a current analysis (Durio and Walker-Batson, 1978) we are finding that originality and imagery are related much more significantly than imagery and divergent thinking, or originality and divergent thinking. It may be that the construct of divergent thinking is more similar to the construct of intelligence when divergent thinking aptitude test items require greater use of the verbal processing system in creative problem solving than use of visuo-spatial holistic modes of processing information.

It seems reasonable to assume both imaginal and verbal coding systems are integrated in creative behavior, but each system may have a special association with different components of the creative process. It seems likely that the imaginal gestalt mode is more related to the initial generation process in creative thinking, while the verbal analytical mode is more involved in later production and communication functions.

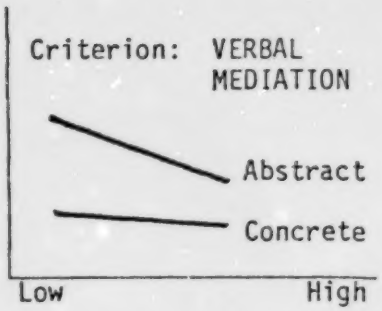
It would appear that multi-disciplinary effort will be required for fuller exploration of the fascinating area of

creative behavior. The value of such study is indisputable. Piaget, for example, whose brilliant model of the development of intelligence has always emphasized the growth of logic, recently recognized creative thought as the ultimate performance of man. Pines (1976) reported that Piaget agreed to address the 21st International Congress of Psychology in Paris (July, 1976) only if he could talk about his present investigation of "how a new idea arises in the human mind", rather than his past research into the development of logical thought. Piaget explained that he has now become "obscessed" with how man creates and invents new ideas out of what is available in his cognitive structure. It is likely that we will begin to see a resurgence of interest in the empirical investigation of creative thinking in American psychology.

HYPOTHESES FOR FIGURES AND NOUN PAIRS



Divergent Thinking
Aptitude Level



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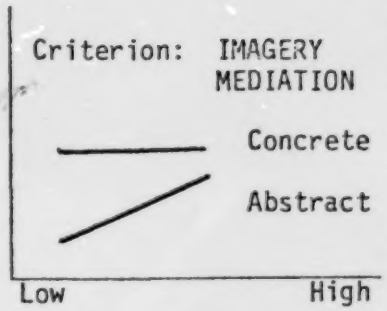
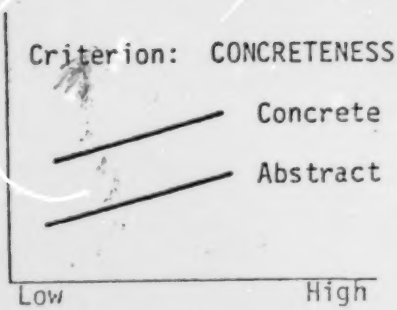


Divergent Thinking
Aptitude Level

RESULTS FOR FIGURES AND NOUN PAIRS



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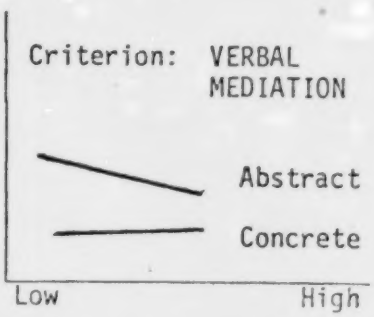
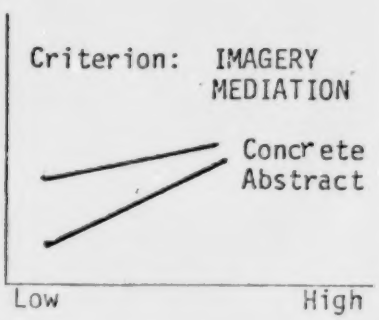
Aptitude Level



Divergent Thinking
Aptitude Level



Divergent Thinking
Aptitude Level

FIGURE 1

TABLE I

RESPONSE CONCRETENESS TO CONCRETE AND ABSTRACT FIGURES AND NOUNS

Source Table and Means of All Significant Effects of Four-Way Analysis of Variance for Stimuli with Test Order, Level of Divergent Thinking, Stimulus Type, and Stimulus Abstraction Level as Factors

	Mean	M.S.	d.f.	F	P
Test Order		235.9860	1/85	1.56	.21
One	42.59				
Two	44.22				
Divergent Thinking		613.6440	1/85	4.07	.04
High	44.72				
Low	42.09				
Stimulus Type		12708.5000	1/85	110.01	.00(
Figures	49.39				
Nouns	37.41				
Stimulus Abstraction Level		25177.6000	1/85	310.81	.00(
Concrete	51.83				
Abstract	34.97				
Test Order X Divergent Thinking		121.4360	1/85	.80	.37
Test Order X Stimulus Type		346.9666	1/85	3.00	.08
Test Order X Stimulus Abstraction Level		512.8520	1/85	6.33	.01
One/Concrete	49.81				
One/Abstract	35.36				
Two/Concrete	53.85				
Two/Abstract	34.58				
Divergent Thinking X Stimulus Type		101.0240	1/85	.87	.35
Divergent Thinking X Stimulus Abstraction Level		5.8340	1/85	.00	.97
Stimulus Type X Stimulus Abstraction Level		3023.0400	1/85	48.99	.00(
Figures/Cono.	54.90				
Figures/Abst.	43.88				
Nouns/Cono.	48.77				
Nouns/Abst.	26.06				
Test Order X Divergent Thinking X Stimulus Type		73.1019	1/85	.63	.42
Test Order X Divergent Thinking X Stimulus Abstraction		30.8293	1/85	.38	.53
Test Order X Stimulus Type X Stimulus Abstraction Level		8.9274	1/85	.14	.70
Divergent Thinking X Stimulus Type X Stimulus Abstraction Level		100.1380	1/85	1.62	.20
Test Order X Divergent Thinking X Stimulus Type X Stimulus Abstraction Level		10.4148	1/85	.17	.68

TABLE 2

IMAGERY MEDIATION REPORTS TO CONCRETE AND ABSTRACT FIGURES AND NOUNS

Source Table and Means of All Significant Effects of Four-Way Analysis of Variance for Stimuli with Test Order, Level of Divergent Thinking, Stimulus Type, and Stimulus Abstraction Level as Factors

	Mean	M.S.	d.f.	F	p
Test Order		39.5057	1/85	2.75	.10
One	6.30				
Two	5.64				
Divergent Thinking		36.4486	1/85	2.53	.11
High	6.29				
Low	5.65				
Stimulus Type		243.4950	1/85	33.47	.00
Figures	6.80				
Nouns	5.14				
Stimulus Abstraction Level		220.7910	1/85	69.99	.00
Concrete	6.76				
Abstract	5.18				
Test Order X Divergent Thinking		8.2502	1/85	.57	.45
Test Order X Stimulus Type		1.6928	1/85	.23	.63
Test Order X Stimulus Abstraction Level		3.5090	1/85	1.11	.29
Divergent Thinking X Stimulus Type		13.1620	1/85	1.81	.18
Divergent Thinking X Stimulus Abstraction Level		15.6183	1/85	4.95	.02
High/Concrete	6.87				
High/Abstract	5.71				
Low/Concrete	6.65				
Low/Abstract	4.65				
Stimulus Type X Stimulus Abstraction Level		22.5220	1/85	11.54	.00
Figures/Conc.	7.34				
Figures/Abst.	6.26				
Nouns/Conc.	6.18				
Nouns/Abst.	4.10				
Test Order X Divergent Thinking X Stimulus Type		1.6008	1/85	.22	.64
Test Order X Divergent Thinking X Stimulus Abstraction		.1415	1/85	.04	.83
Test Order X Stimulus Type X Stimulus Abstraction Level		1.3478	1/85	.69	.40
Divergent Thinking X Stimulus Type X Stimulus Abstraction Level		3.3603	1/85	1.72	.19
Test Order X Divergent Thinking X Stimulus Type X Stimulus Abstraction Level		3.0682	1/85	1.57	.21

TABLE 3

MULTIPLE REGRESSION ANALYSIS FOR DIVERGENT THINKING APTITUDE ON 2 VARIABLES

Multiple Correlation	F Ratio		Beta Weights Variable	Weight	Correlation
$\underline{R}$ = .5156	$\underline{R}^2$ Full Model (17 Predictors)	.456	CRT_{SR}	.4187	.390*
	$\underline{R}^2$ Reduced Model (2 Predictors)	.265	RC_{AF}	.3379	.303*
	Difference	.191			
	F (19, 71)	1.308			
	p	> .05			

*$p < .05$

CRT_{SR} Creativity Self-Rating

RC_{AF} Response Concreteness to Abstract Figures

TABLE 4

MULTIPLE REGRESSION ANALYSIS FOR IMAGERY MEDIATION ON 2 VARIABLES

Multiple Correlation	F Ratio		Beta Weights Variable	Weight	Correlation
$\underline{R}$ = .564	$\underline{R}^2$ Full Model (16 Predictors)	= .490	RC_{ANP}	.3686	.440*
			CD_{SR}	.3442	.437*
	$\underline{R}^2$ Reduced Model (2 Predictors)	= .318			
	Difference	= .172			
	F (14,72)	= 1.735			
	p	> .05			

*p < .05

RC_{ANP} Response Concreteness to Abstract Noun Pairs

CD_{SR} Dominant Coding Style Self-Rating

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